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(I) Nonlinear Atomic Force Microscopy

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We propose a driving scheme in dynamic Atomic Force Microscopy (AFM) to maximize the time the tip spends near the surface during each oscillation cycle. Using a quantum description of the oscillator that employs a generalized Caldeira-Leggett model for dissipative oscillator-surface interaction, we predict large classical squeezing and a small amount of skewness of the probability distribution of the oscillator. Our model also predicts that a dissipative surface force may enhance quantum effects in the motion of a micro-mechanical oscillator that interacts with a surface.

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